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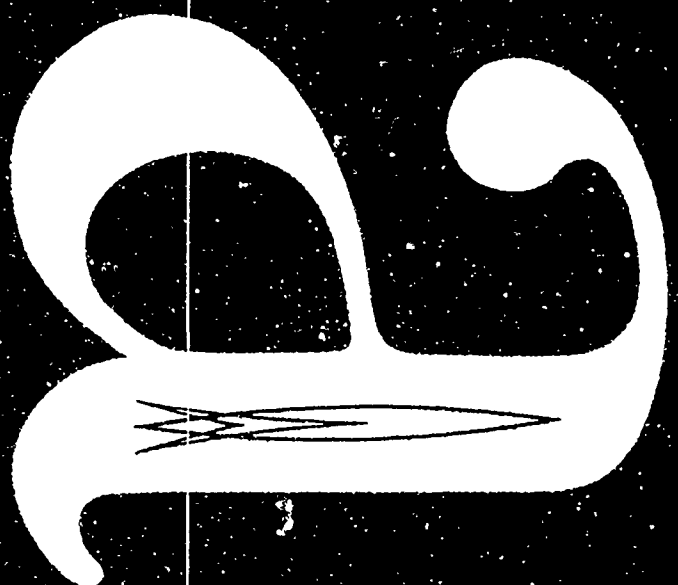

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CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

PRELIMINARY OPERATING AND MAINTENANCE INSTRUCTIONS for the SQUIB ADAPTER CHECKOUT CASE

(27-5093-1 and on)

PART NO. 27-53373

REPORT NO AZE 27-210

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REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED

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TABLE OF CONTENTS

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SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. INTRODUCTION

1-2. This manual provides operating and maintenance instruction for Squib checkout case, End Item Description (E.I.D.) 27-5093-1 and on. The applicable top drawing number for this E.I.D. is 27-53373. This equipment is used for the checkout of the XSM-65D IOC Missile squib and link circuits. The instructions, given in this manual are based on information available on the date of publication and are interim in nature.

Personnel concerned with operation or maintenance of the equipment can contribute to the effectiveness of any subsequent revision by forwarding comments or suggestions to the Engineering Data Unit, Test Equipment Group, Convair-Astronautics, Main Zone 547-80, P.O. Box 1128, San Diego, California.

1-3. COMPONENT LEVEL EQUIPMENT. The following is the list of equipment necessary for the component level testing of the squibs and links.

	DESCRIPTION	PART NUMBER
a.	Douglas Igniter Tester	5695517
b.	10 ft. adapter harness	27-54291
c.	1 ft. component adapter harness	27-54285
d.	" " " "	27-54286
e.	" " " "	27-54287
f.	" " " "	27-54288
g.	" " " "	27-54289
h.	" " " "	27-54290
i.	" " " "	27-54405

CONVAIR ASTRONAUTICS

1-4. SQUADRON MAINTENANCE AREA EQUIPMENT. The following equipment is used for system level maintenance in the Squadron Maintenance Area (S.M.A.).

	DESCRIPTION	PART NUMBER
a.	Douglas Igniter Tester	5695517
b.	Squib Checkout Adapter Case	27-53373
c.	Harness P2401	27-54293
d.	Harness P2 to P301 & P303	27-54295
e.	Harness P3 to P1005 & P1007	27-54292

1-5. PRE-LAUNCH EQUIPMENT. The following equipment is used for system level, Pre-launch testing.

	DESCRIPTION	PART NUMBER
a.	Douglas Igniter Tester	5695517
b.	Squib Checkout Adapter Case	27-53373
c.	Harness, P2401 to P1	27-54293
d.	Harness, P2 to P301 & P303	27-54295
e.	Harness, P3 to Ground Relay Box	27-54294

1-6. DOUGLAS IGNITER TESTER, (SEE FIGURE 1) The Douglas igniter tester consists of a special low current volt-ohm meter mounted in a weatherproof case. The case contains storage space for adapter harnesses.

1-7. SQUIB CHECKOUT ADAPTER CASE (SEE FIGURE 2). The squib checkout adapter case consists of a weatherproof case containing a squib selector box and providing storage for the adapter harnesses. These harnesses are not all used in conjunction with the Checkout case, but are used in the component level test. The selector box provides a means of checking each of the squib and link circuits from a central location.

1-8. Drawing Breakdown, The following gives a complete list, in tabulated form of the drawings for the Igniter systems checkout case.

	DESCRIPTION	DRAWING NUMBER
a.	Squib C/O Adapter	27-53373
b.	Schematic Diagram - Squib C/O Adapter	27-54279
c.	Chassis - Squib C/O Adapter	27-54278
d.	Cover - Squib C/O Adapter	27-54277
e.	Panel - Squib C/O Adapter	27-54276
f.	Case Modification - Squib C/O Adapter	27-54275
g.	Cable - Squib C/O Adapter, P4-1 to J1	27-54285
h.	Cable - Squib C/O Adapter, P4-2 to P2	27-54286 -3
i.	" " " " , P4-3 to J3	27-54287
j.	" " " " , P4-4 to P4	27-54288
k.	" " " " , P4-5 to Terminal WG5	27-54289
l.	" " " " , P4-6 to J6	27-54290
m.	" " " " , P2401 to J4	27-54291
n.	" " " " , P3 to P1005 & P1007	27-54292
o.	" " " " , P2401 to P1	27-54293
p.	" " " " , P3 to J21A	27-54294
q.	" " " " , P2 to P301 & P303	27-54295
r.	" " " " , P4-7 to P7	27-54405

1-9. REFERENCES:

a) Job Manual, Missile Airframe Maintenance, Volume V1, Pyrotechnics and Destruct Packages. Report Number AZI 27-032.

b) Squib Checkout, Operating Procedure, E.O.P. 230.112.

c) Squib Checkout Case, Validation Procedure, E.O.P. 230.113.

d) Douglas Tester Operating Procedure, Report Number 7695592.

e) Douglas Tester Validation Procedure, Report Number 7695590.

The procedures bearing E.O.P. numbers are prepared by Quality Control, those with an AZI are prepared by Service Publications. All others were prepared by Douglas Aircraft Co. and must be obtained as vendors manuals.

SECTION II

THEORY OF OPERATION

2-1. MISSILE SYSTEM

2-2. The missile system squibs consists of two main types. The igniter squibs which receive their signal from a ground junction box and autopilot function squibs which receive their signal from the autopilot programmer. The igniters consist of one or more squibs, a link, and the pyrotechnic material, which when ignited, furnishes ignition to the engine or gas generator with which it is associated.

2-3. A squib is similar in function to a primer. The squib will detonate and cause the pyrotechnic material to be ignited when the proper current is passed through it.

2-4. The link circuit consists of a wire imbeded in the pyrotechnic mixture. When the squib is fired the pyrotechnic mixture is ignited and burns through the wire, opening a circuit. The circuit gives a positive indication of igniter firing. In addition, there are three ignition detector links, one for each of the main engines. These links consists of wires stretched across the mouth of the thrust chamber. The wire is parted by the heat from the burning fuel and LO_2 and gives a positive indication of engine operation.

2-5. There are four functions controlled by the autopilot and actuated by the firing of one or more pyrotechnic cartridges or squib operated valves. The action of these cartridges and valves is as follows:

a) The squib activated Booster separation valve which controls the flow of gaseous helium to the booster separation fittings.

b) Nosecone umbilical ejector cartridge which disengages the nosecone umbilical.

c) Three nosecone separation cartridges, which are connected in series, unlatch the re-entry vehicle adapter fittings.

2-6. TEST EQUIPMENT

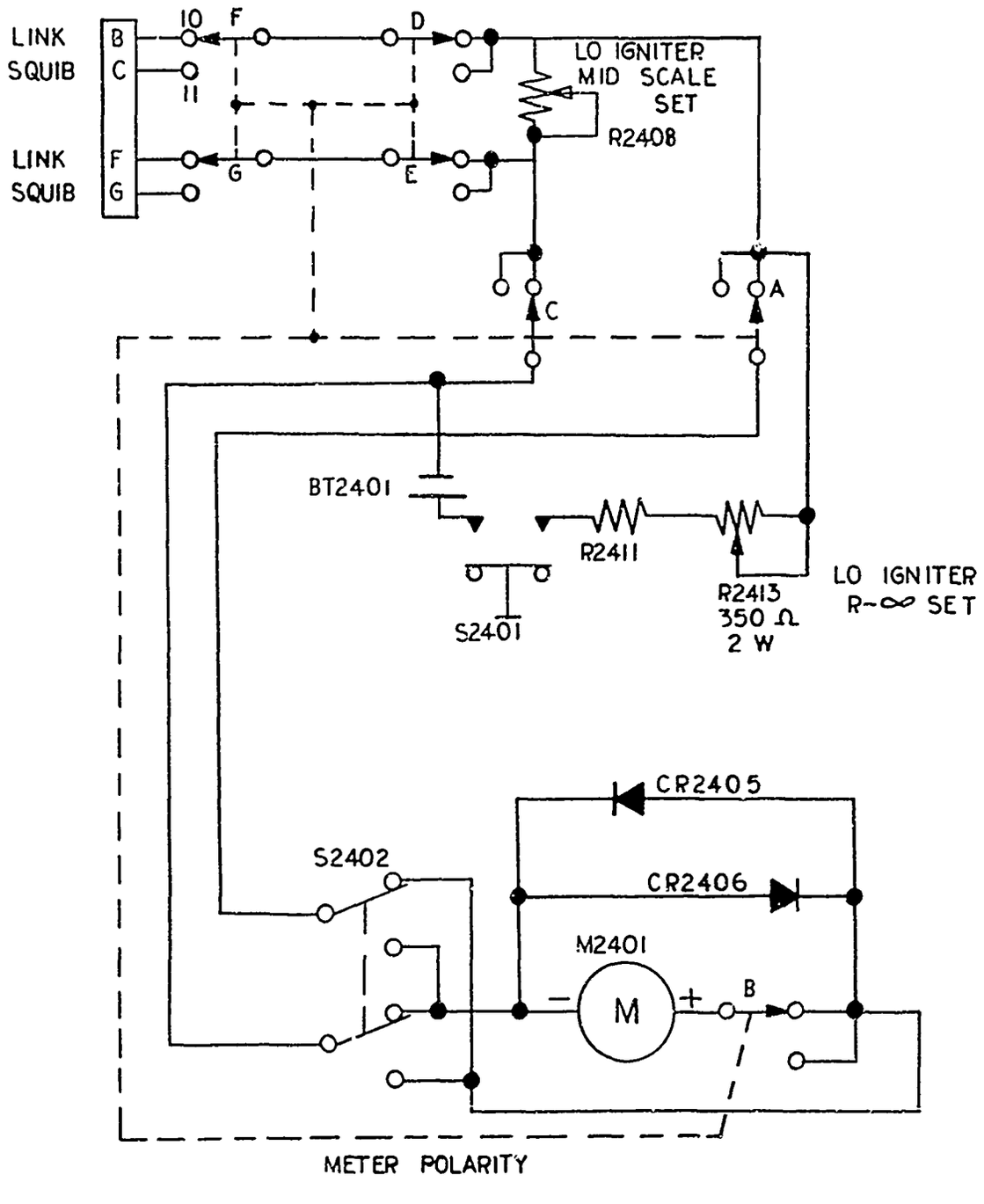
2-7. DOUGLAS IGNITER TESTER (see figure 3 for schematic). The Douglas tester was designed for two functions. One is to determine if the circuit in which the igniter is to be connected is safe and second to determine the operational capability of the igniters at a component level. The first is accomplished by connecting the tester to the igniter connector and with no signal applied measures the terminal voltage. If the voltage due, to stray pickup, etc., is below a certain level the circuit could be considered safe for the installation of the igniters. The second function is accomplished by measuring the resistance of the squibs and determining if it is within the prescribed limits.
Since the squibs require between 500 to 1500 miliamps for detonation, the current which is used to measure the squib resistance must be much lower than 500 miliamps to prevent firing of the squibs during this test. The Douglas tester is designed with a shunt so that the current will always be much lower i.e., 10% or less, than the current required to fire the squibs. For testing the resistance of the links and squibs, position 10 and 11 of the selector switch are used. These two positions furnish identical circuits through the Douglas tester. See simplified schematic following page.
Position 10, LINK LO_2 IGNITER 2R is connected through the various adapters for checking the igniter links.
Position 11, LO_2 IGNITER 1R is connected through the various adapters for checking the squibs.

2-8. Squib adapter case (see Figure 4 for schematic). The squib adapter case, connects to the Douglas Igniter tester, and contains switches to select the various squibs and links to be checked. The function of the selector switches are as follows:

a) S1 selects the autopilot programmer squibs.

b) S2 selects the Rocketdyne igniter squibs.

c) S3 selects the Rocketdyne igniter links.


LINK SQUIB
B
C
LINK SQUIB
F
G
10
11
F
G
D
E
LO IGNITER MID SCALE SET
R2408
C
A
BT2401
S2401
R2411
R2413
350 Ω
2 W
LO IGNITER
R-∞ SET
CR2405
CR2406
S2402
M2401
M
B
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SECTION III

INSTALLATION AND INITIAL ADJUSTMENT

3-1. INSTALLATION

3-2. The equipment is installed and connected as shown in the harness connection diagrams on the following three pages. TABLE II gives the tabulation of component adapter harness, Douglas Igniter Test Selector position, and Value of resistance for each of the squibs. TABLE I, below 3-5, gives the function of the squibs, the number of each type to be tested, and the Reference number of the connectors of each type.

3-3. VALIDATION

3-4. The validation procedure for this equipment is E.O.P. 230.113 and is the only procedure to be used in determining the operational capability of the squib checkout case. This procedure is prepared by the Quality Control Group.

3-5. A tabulation of the function of each of squib cartridges and igniters listed on the proceeding page is given in the table below for familarization purposes.

TABLE I

PART NUMBER	FUNCTIONAL DESCRIPTION	NUMBER USED	CONNECTOR DESIGNATION
650291	Vernier engine igniter	2	J41, J42
650183	Gas generator igniter	4	J55, J56, J155, J156
932B383P-2	Nosecone umbilical eject squib	1	J215-1
650151	Thrust chamber igniters	3	P40, P141, P142
27-04304-1	Booster jettison squibs	1	J183
7-04285-1	Nosecone jettison squib	3	Z8, 29, 210
27-08580-1	Alternate hydraulic supply valve	1	P720
27-04300-1	Retro-rocket igniter squibs	2	P19, P20

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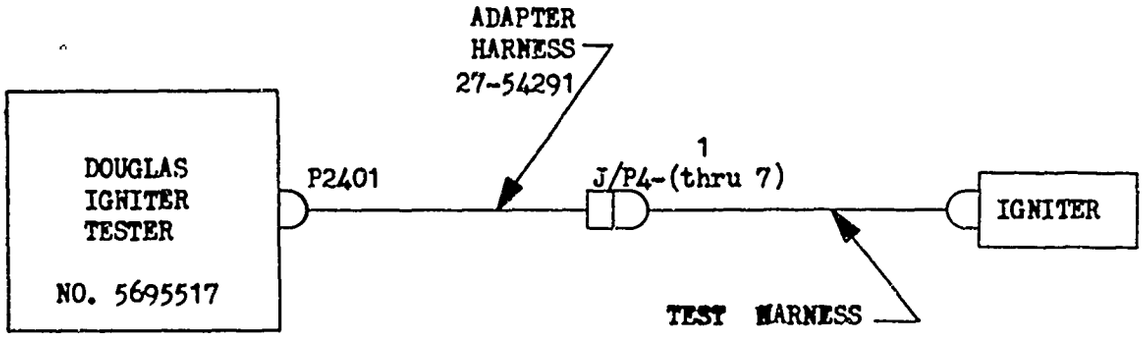
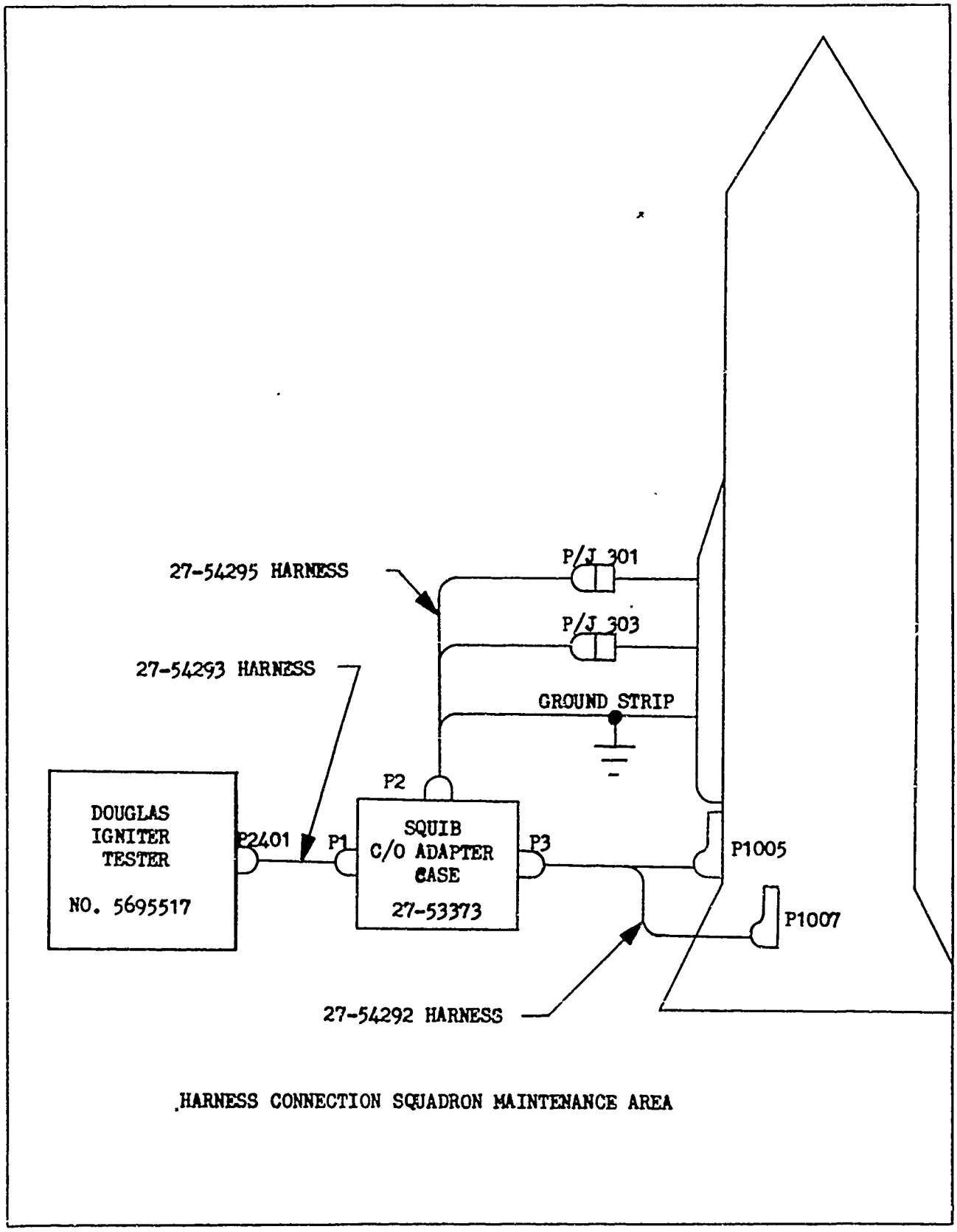


HARNESS CONNECTION COMPONENT LEVEL TEST

TABLE II

IGNITER PART NO.	COMPONENT TEST HARNESS	FUNCTION SELECTOR SWITCH	RESISTANCE IN OHMS
27-04304-1	27-54288	LO IGNITER 1R	0.8 - 0.4
7-04285-1	27-54289	LO IGNITER 1R	1.0 - 0.3
**932B383P-2	27-54286	LO IGNITER 1R	1.2 - 0.4
27-08580-1	27-54290	LO IGNITER 1R	3.0 - 7.0
27-04300-1	27-54405	LO IGNITER 1R	1.0 - 0.3
650183	27-54286	LO IGNITER 1R	0.45 - 0.75 (Squib)
		LINK LO IGNITER 2R	0.15 MAX. (Link)

* ROCKETDYNE PART NO.
** G. E. PART NO.



HARNESS CONNECTION SQUADRON MAINTENANCE AREA

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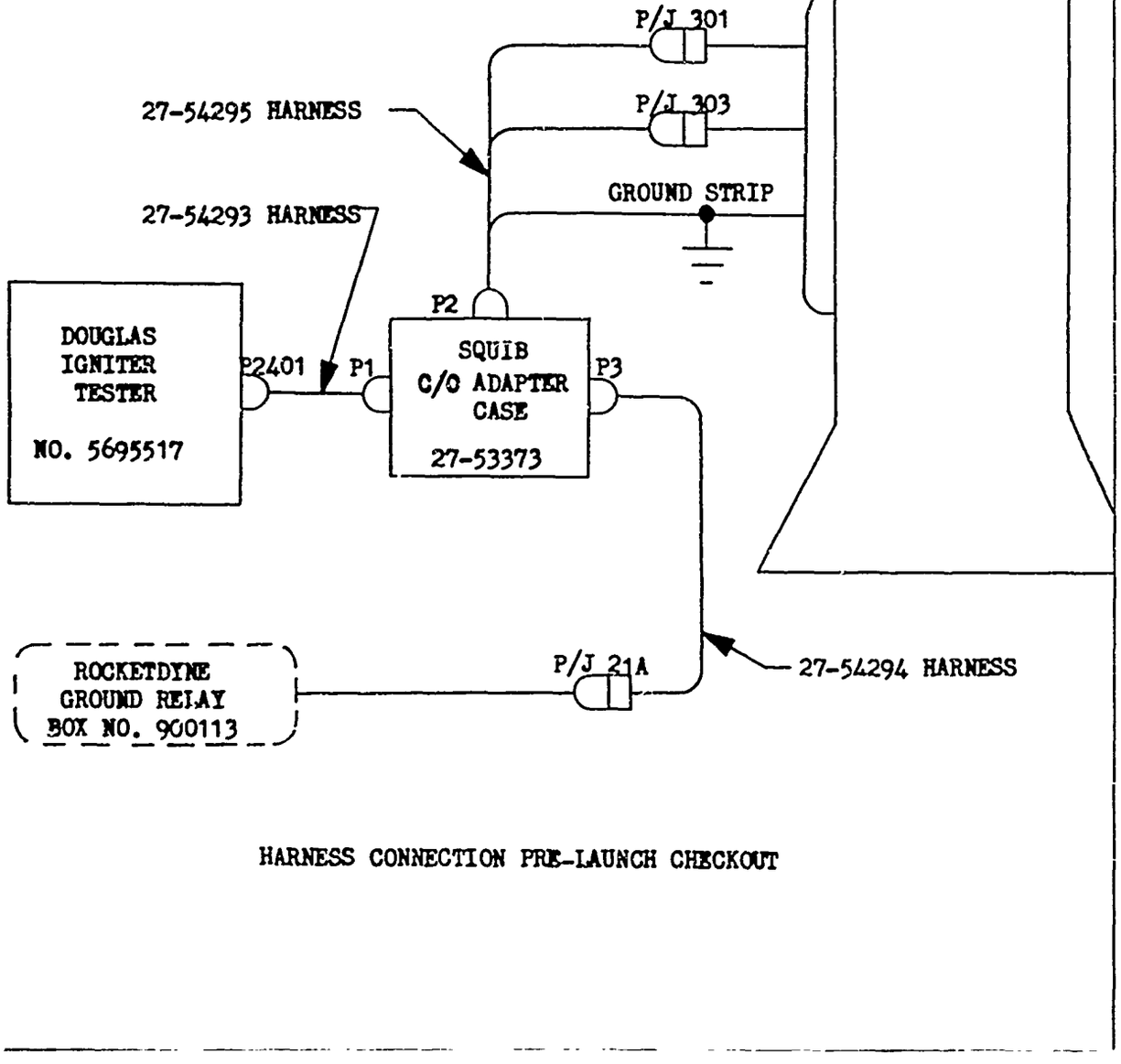
NOTE:
P2 & P3 cannot be connected simultaneously due to location of ground relay box relative to the missile.



HARNESS CONNECTION PRE-LAUNCH CHECKOUT

SECTION IV

OPERATION

4-1. OPERATING PROCEDURE.

cancelled!

4-2. The operating procedure, E.O.P. 230.112, is prepared by Quality Control and is the only recognized procedure for checking the operational capabilities of the squib and link circuits. This procedure contains the checkout procedure for all three tests, i.e.: Component level, SMA, and Pre-launch.

SECTION V

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE

5-2. Since the squib checkout case contains only switches the normal validation for this equipment provides adequate preventive maintenance.

5-3. CORRECTIVE MAINTENANCE

5-4. Complete corrective maintenance information for the squib checkout case has not been determined at this time. Since the squib checkout case contains only switches and wires, continuity checks of the various circuits will be the only trouble shooting procedure necessary. A schematic of the checkout case, see figure 4, will be of help in trouble shooting. The Douglas tester may be used for the continuity checks.

SECTION VI

EXPENDABLE PARTS LIST

6-1. PARTS LIST

6-2. The following is a list of the expendable parts for the squib adapter checkout cass.

REFERENCE NO.	DESCRIPTION	PART NO.	QTY./ASS'Y.
51, 52, & 53	switch, rotary, 11 position	87-44900-207	3
54	switch, toggle, 3 position DPDT	MS35059-4	1

SECTION VII

ILLUSTRATIONS

7-1. GENERAL

7-2. This section contains the following illustrations:

7-3 Harness connections diagrams may be found in Section III.

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PHOTO TO BE SUPPLIED AT A LATER DATE

FIGURE 1. DOUGLAS IGNITER TESTER

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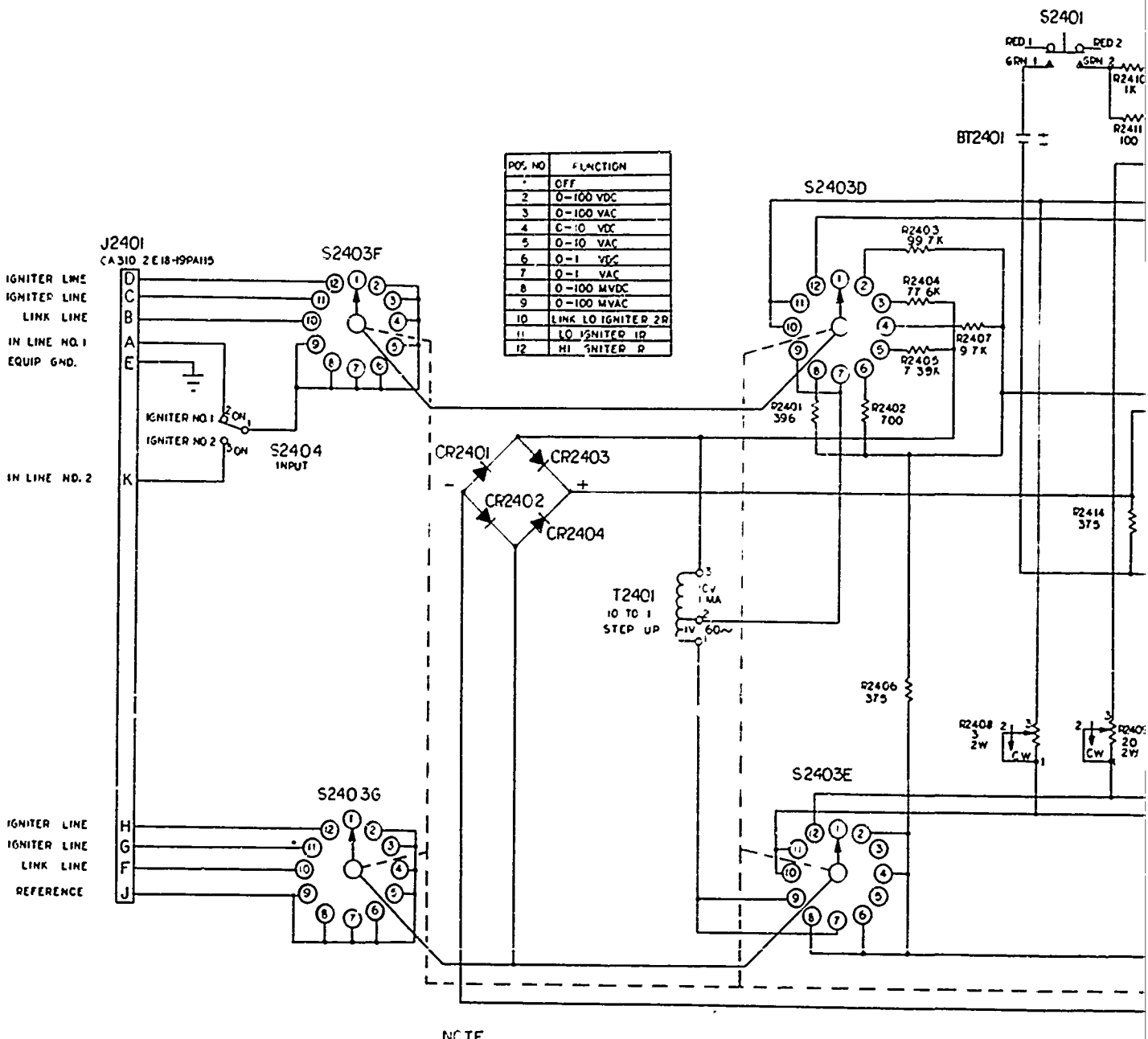
FIGURE 2. SQUIB CHECKOUT ADAPTOR CASE

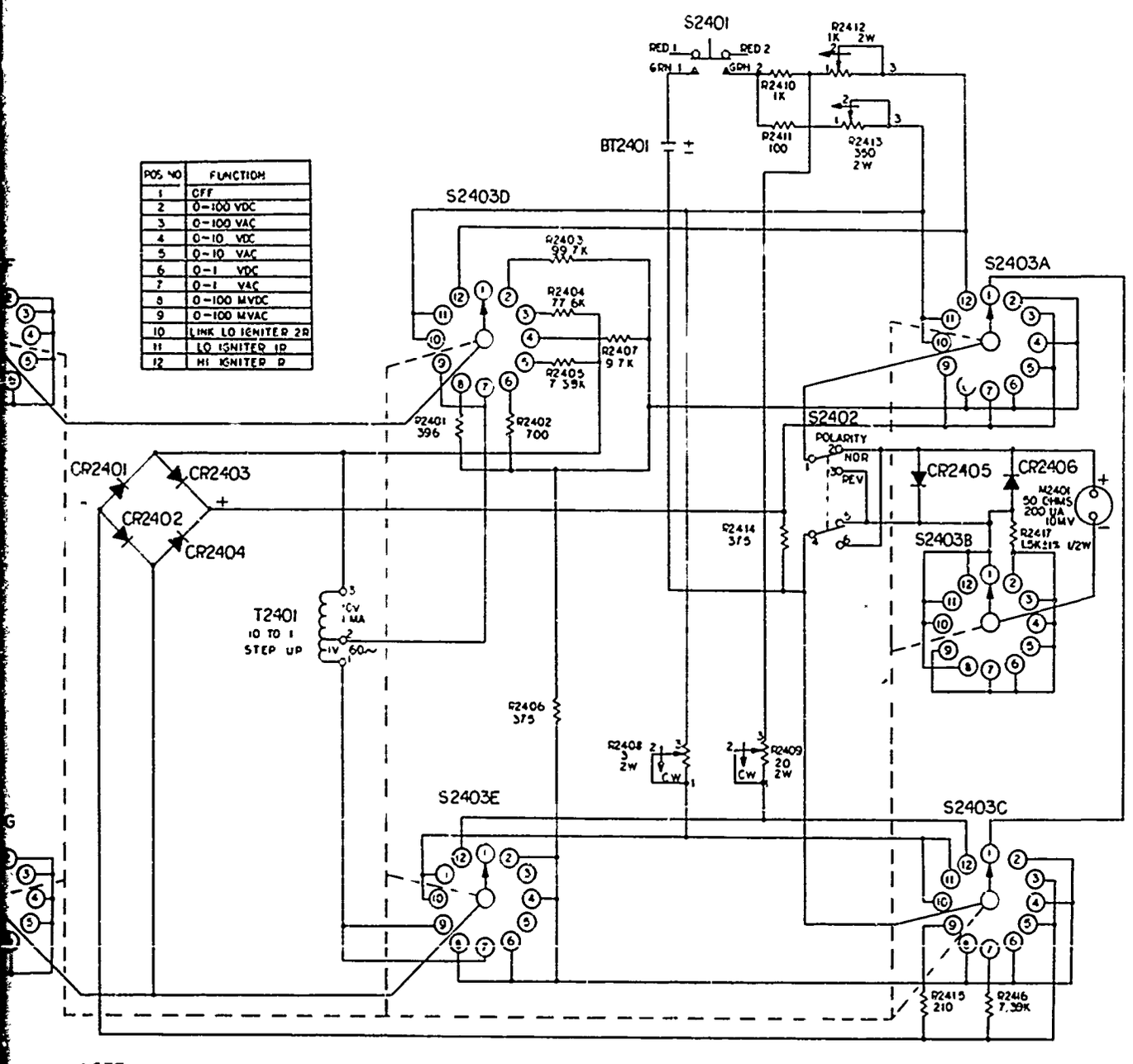


POS. NO	FUNCTION
1	OFF
2	0-100 VDC
3	0-100 VAC
4	0-10 VDC
5	0-10 VAC
6	0-1 VDC
7	0-1 VAC
8	0-100 MVDC
9	0-100 MVAC
10	LINK LO IGNITER 2R
11	LO IGNITER 1R
12	HI IGNITER R

NOTE ALL RESISTORS ARE $\frac{1}{2}$W AND VALUE IS GIVEN IN OHMS UNLESS OTHERWISE SPECIFIED.

FIGURE

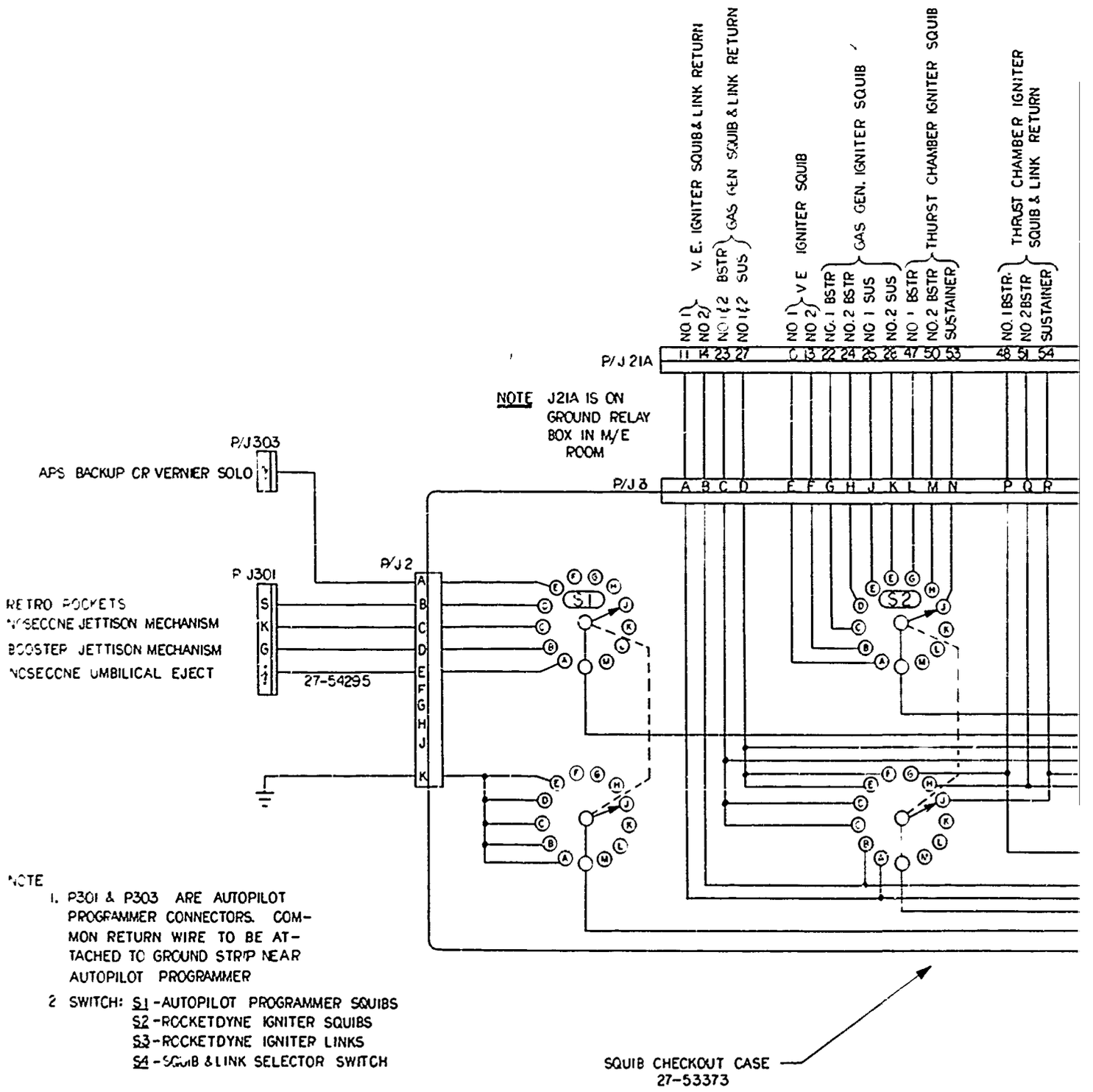
A.



NOTE: ALL RESISTORS ARE $\frac{1}{2}$ W AND VALUE IS GIVEN IN OHMS UNLESS OTHERWISE SPECIFIED.

FIGURE 3 SCHEMATIC DIAGRAM, DOUGLAS IGNITER TESTER

B.



NOTE

1. P301 & P303 ARE AUTOPILOT PROGRAMMER CONNECTORS. COMMON RETURN WIRE TO BE ATTACHED TO GROUND STRIP NEAR AUTOPILOT PROGRAMMER
2. SWITCH: S1 - AUTOPILOT PROGRAMMER SQUIBS
   S2 - ROCKETDYNE IGNITER SQUIBS
   S3 - ROCKETDYNE IGNITER LINKS
   S4 - SQUIB & LINK SELECTOR SWITCH

A.

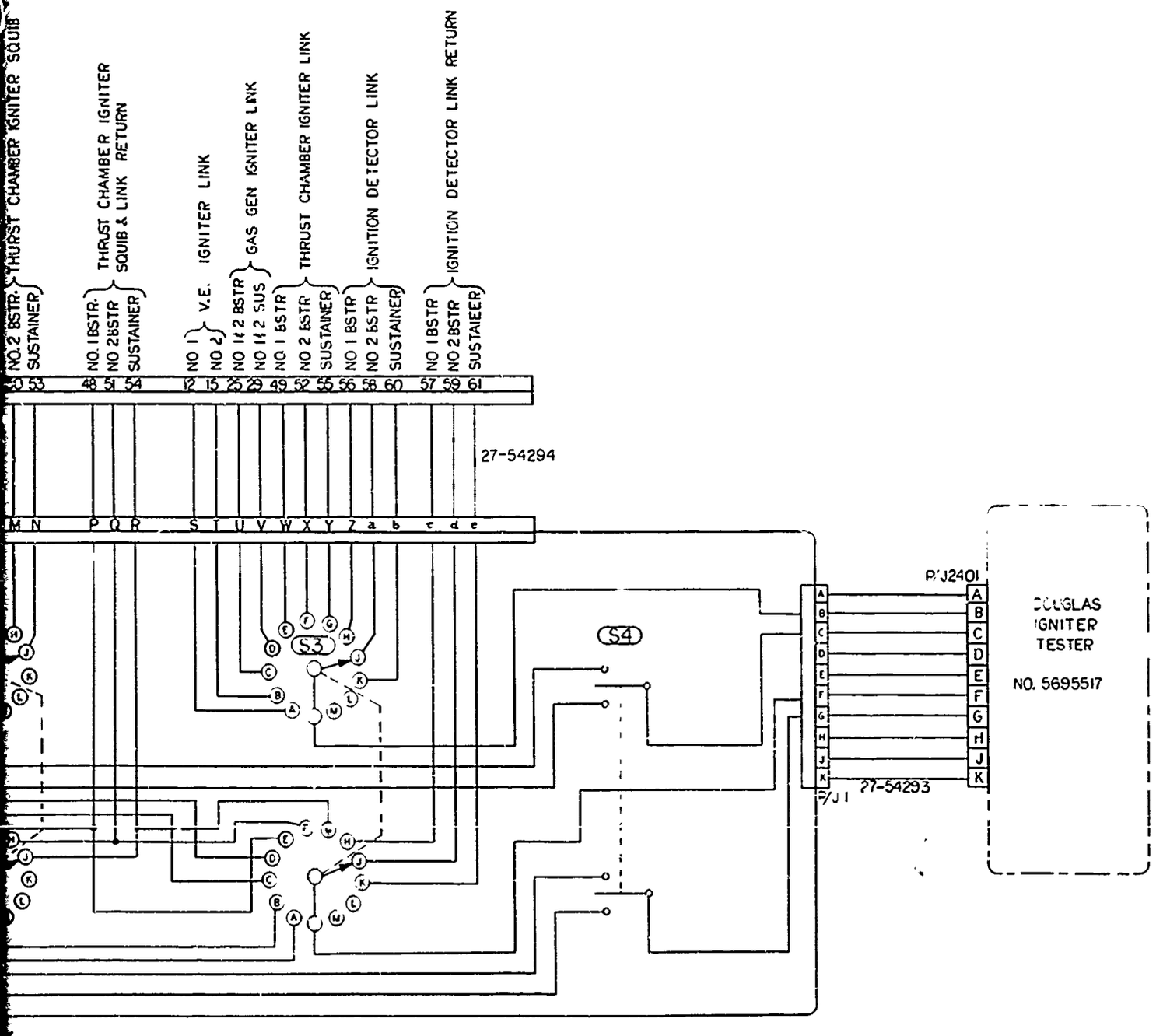


FIGURE 4 SCHEMATIC DIAGRAM, ADAPTER SQUIB CHECKOUT CASE AND HARNESSES

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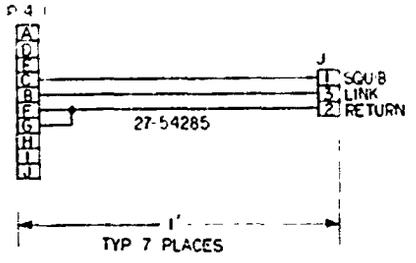
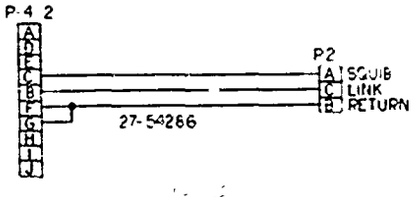
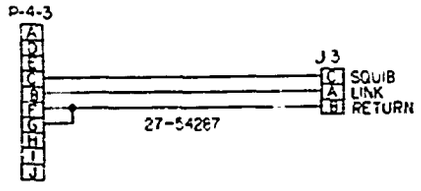
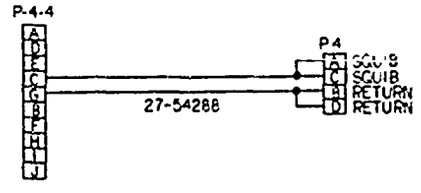
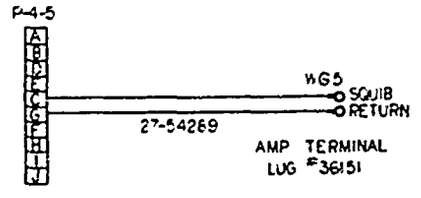
COMPONENT TEST HARNESSES

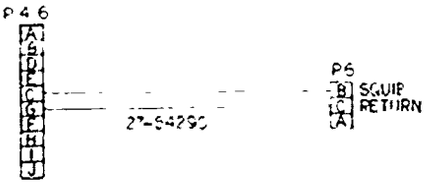


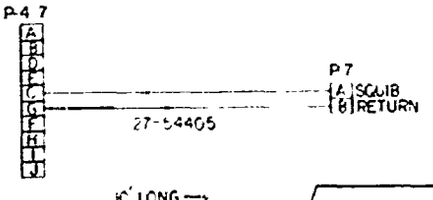


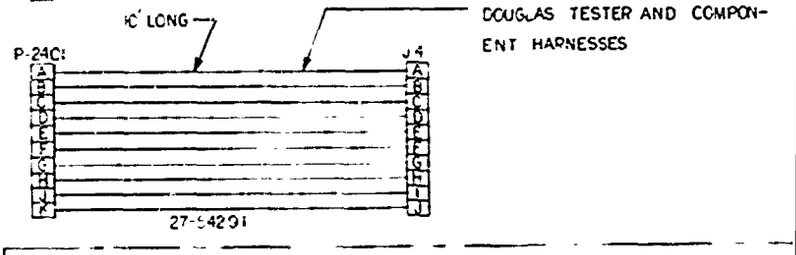












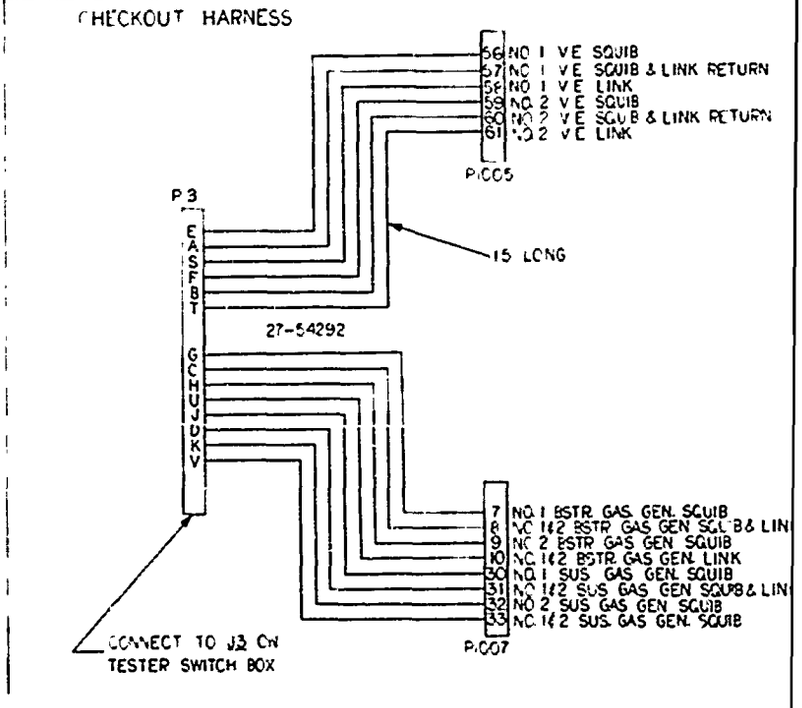


FIGURE 5 WIRI
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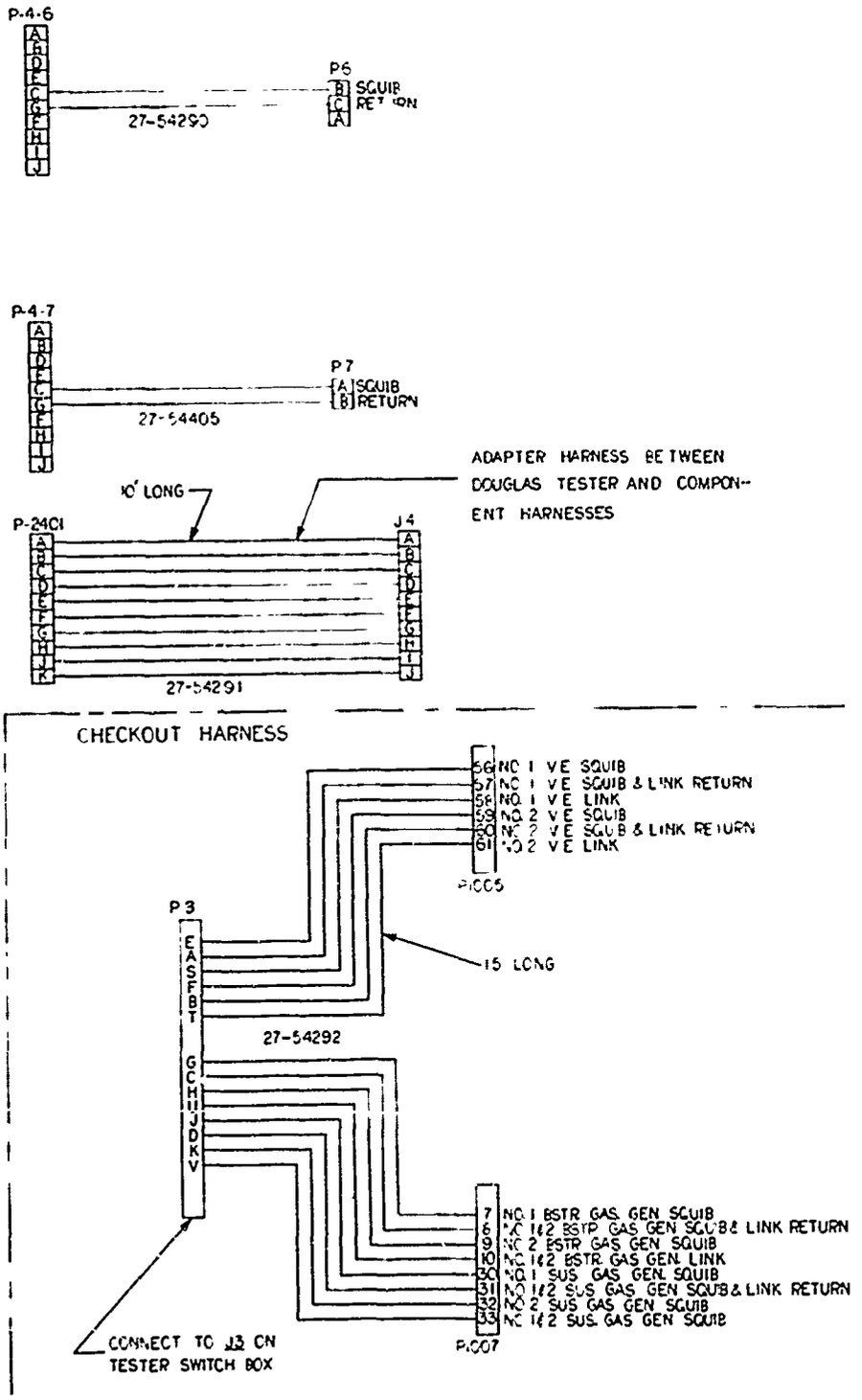

FIGURE 5 WIRING DIAGRAM, COMPONENT LEVEL CHECKOUT HARNESSES

B.